

Assessment of endoscopic sinus surgery in management of sinonasal diseases

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Abstract

Background: functional endoscopic sinus surgery (FESS) has revolutionized surgical care, opening new horizons in the management of chronic rhinosinusitis and other paranasal sinus disorders Messerklinger established and reiterated the importance of the sinus ventilation and pattern of mucociliary clearance. FESS was first described independently by both Messerklinger in German literature and Wigand.

Aim of the work: this study aimed to assess the efficacy, safety and benefits of FESS in cases of chronic recurrent rhinosinusitis with or without nasal polyposis, fungal sinusitis, septal and turbinate pathology and CSF rhinorrhea in terms of morbidity, mortality and recurrent of disease. **Patients and Methods:** this study was conducted in Bab Elshaerea University Hospital and Hearing and Speech Institute from July 2017 to August 2018. A total of 50 patients with clinical evidence of sinonasal diseases were categorized into 4 groups (Chronic recurrent rhinosinusitis with or without nasal polyposis (20 patients), fungal sinusitis (10 patients), septal and turbinate pathology (10 patients) and CSF rhinorrhea (10 patients)). Patients were evaluated with nasal endoscopy and computed tomographic (CT) evaluation prior to FESS. **Results:** out of 50 patients, 26 were male and 24 were female in the present study. Male: female ratio was 52:48. Depending on symptoms, endoscopic examination and CT scanning, three patients only had recurrence (Two patients from group of chronic recurrent rhinosinusitis with or without nasal polyposis and one patient from fungal sinusitis group). **Conclusion:** FESS provided an excellent and safe method for treating sinonasal disease. The success rates were encouraging, but because of the nature and chronicity of the disease, longer follow-up was necessary to truly assess the surgical effectiveness of the procedure.

Key words: surgery, sinonasal disease.

Introduction

Functional endoscopic sinus surgery is a complex procedure used by otorhinolaryngologists to treat a host of nasal sinus pathologies⁽¹⁾. Functional endoscopic sinus surgery (FESS) is a minimally invasive surgical treatment which uses nasal endoscopes to enlarge the nasal drainage pathways of the paranasal sinuses to improve sinus ventilation⁽²⁾. This procedure is generally used to treat inflammatory and infectious sinus diseases, including chronic rhinosinusitis that doesn't respond to drugs, nasal polyps, some cancers, and decompression of eye

sockets/optic nerve in Graves ophthalmopathy⁽³⁻⁵⁾. The first recorded instance of endoscopy being used for visualization of the nasal passage was in Berlin, Germany in 1901⁽⁶⁾. Alfred Hirschmann, who designed and made medical instruments, modified a cystoscope to be used in the nasal cavity. **Hirschmann** published Endoscopy of the nose and its accessory sinuses⁽⁷⁾. **Reichart** performed the first endoscopic sinus surgery using a 7 mm endoscope. Maltz also encouraged the use of endoscopes as a diagnostic tool for nasal and sinus abnormalities⁽⁶⁾.

Harold Hopkins used his background in physics to develop an endoscope that provided more light and had drastically better resolution than previous endoscopes⁽⁶⁾. **Walter Messerklinger** published the book titled *Endoscopy of the Nose* on his findings and his proposed methods to utilize nasal endoscopy for diagnosis⁽⁸⁾. After learning of **Messenklinger's** endoscopic techniques, **David Kennedy** and **Karl Storz** developed instruments for use in endoscopic sinus surgery, and coined the term Functional Endoscopic Sinus Surgery⁽⁹⁾. **Kennedy** published multiple papers on FESS use and technique, and in 1985 the first course on FESS was taught in Johns Hopkins Medical Center⁽⁶⁾.

Aim of the work

This study aimed to assess the efficacy, safety and benefits of FESS in cases of chronic recurrent rhinosinusitis with or without nasal polyposis, fungal sinusitis, septal and turbinate pathology and CSF rhinorrhea in terms of morbidity, mortality and recurrent of disease.

Materials and Methods

This study was conducted in the Department of Otorhinolaryngology and Head and Neck Surgery at Bab El-Shaerea Hospitals and Hearing and speech institute. A total of 50 patients categorized into 4 groups (Chronic recurrent rhinosinusitis with or without nasal polyposis (20 patients), fungal sinusitis (10 patients), septal and turbinate pathology (10 patients) and CSF rhinorrhea (10 patients)), who were evaluated with nasal endoscopy and computed tomographic evaluation prior to FESS. These cases were selected from the patients attending the ear nose and throat (ENT) outpatient department (OPD). All patients in this studied group were subjected to a detailed history of a wide spectrum of presenting symptoms *viz.* facial pain, headache, nasal discharge (Whether it is watery, mucoid, purulent or blood mixed), nasal obstruction (Its duration, whether it was continuous or intermittent and whether it is associated with any external nasal deformity). The presence of other symptoms, such as

postnasal discharge, sneezing, acute/chronic/serous otitis media, was also noted in full details. The complete personal, past, and family history were also elicited in addition with past medical/surgical history to know about any chronic use of antihistaminic, steroid sprays, and other medications in the past. All patients were subjected to thorough ENT examination with special emphasis on anterior and posterior rhinoscopy. Nasal Endoscopy was done using Hopkins rod endoscopes (0°, 30°) computed tomography (CT) of paranasal sinuses was done and CT cysternography was done in patients with CSF rhinorrhea. After a detailed nasal endoscopy and CT-scan study, patients underwent surgery-FESS. The patients included in the present study were explained in details about alternative modes of treatment, nature of the surgery, outcomes of surgery including benefits as well as possible complications of surgery. They were also detailed with the need for regular post-operative follow-up to monitor healing and avoid post-operative complications.

The operative technique used was planned in accordance to the need of the individual case. Surgical endoscopic management of concha bullosa and surgery of deviated nasal septum (Endoscopic septoplasty) was always planned in concert with the treatment of inflammatory disease in adjacent osteomeatal complex, ethmoid, and maxillary sinus. In the case of presence of extensive inflammatory disease in ethmoids and maxillary sinus, coherent FESS was done after endoscopic excision of concha bullosa was carried out. In all the patient's concepts of the "Messerklinger technique" of FESS were followed. Post-operative medication included an oral course of broad spectrum antibiotic, analgesics, and antihistaminic. The medial orbital wall was skeletonized early in the dissection to provide an essential landmark and the lateral limit of the dissection. The second critical landmark, the skull base was usually identified in the posterior ethmoid. After entering the posterior ethmoid, the roof was slowly skeletonized by removing intercellular partitions working from posterior to anterior and staying close to the medial orbital wall. When the sphenoid

sinus needed to be opened this was typically performed by infracturing the sphenoid bulge in the inferior and medial aspect of the posterior ethmoid or through sphenoethmoidal recess. The opening was then enlarged taking care to enlarge it inferiorly and medially to include the natural ostium of the sphenoid sinus. When the ethmoid roof was carefully identified, the dissection was then continued from posterior to anterior, following the slope of the ethmoid roof into the frontal recess. The zero degree 4 mm telescope was frequently changed for a 4mm 30 degree telescope. The anterior ethmoidal artery was sometimes found immediately inferior to the skull base just posterior to the ethmoid dome. Approximately at the level of a superior extension of the anterior wall of the ethmoid bulla the frontal sinus opening was usually found medially in close proximity to the middle tubrbinate. Care was taken to ensure that the natural ostium of the frontal sinus was identified. If the frontal sinus ostium was closed or markedly stenotic, it was enlarged. Care was taken to remove only the bone when possible and to disturb the mucosa as little as possible. Any granulation tissue or polyps were removed very cautiously. In limited disease, mucosa had been opened. When diffuse disease was present, total ethmoidectomy was continued until all disease identified by CT had been exenterated or marsupialized and ethmoidal cells with normal endoscopic ethmoidectomy, sphenoidotomy, antrostomy and meticulous dissection of the frontal recess was performed.

In cases with CSF rhinorhea, The defects varied, were in the roof of posterior ethmoids, cribriform plate and fovea ethmoidalis . It was necessary to open the

ethmoids and to expose the skull base. After detection of the dehiscent area, the repair was done by grafts from mucosa and bone of middle turbinate or septal and mucoperichondrial grafts. The graft was positioned with gelfoam and surgicel. The cavity was packed for 2 weeks with prophylactic antibiotics. All patients were seen on a weekly basis in OPD until the turbinate and cavity healed completely. At each visit, local care consisted of suction of surgical cavities to remove discharge, clots, crusts to prevent synechiae formation between the middle turbinate and lateral nasal wall. If any adhesions were formed, they were released. **The study was approved by the Ethics Board of Al-Azhar University.**

Results

Chronic rhinosinusitis with and without polyps:

Clinical Data: the results of 20 patients with chronic rhinosinusitis with and without polyps were analyzed. Age: the mean age was 39.55 years with a range of 18-55 years.

Sex: male: female ratio was 40 : 60%.

Post-operative subjective assessment:

Improvement was 90% (18 patients) with no improvement in 10% (2 patients).

One case presented by postoperative purulent sinus ostia and polypoid mucosa which was male patient aged 20 years old with dextrocardia and recurrent chest infection which was diagnosed by (kartagener syndrome) .Another case presented by nasal polyps and discharge which female patient was 18 years old with bronchial asthma and aspirin hypersensitivity (Samter's triad) which has high recurrence rate.

Table 1: showing post-operative subjective assessment of chronic sinusitis group

	Chronic sinusitis with polyposis (10 patients).		Chronic sinusitis without polyposis (10 patients).		Total (20)	
	N	%	N	%	N	%
No improvement(n=2)	2	20%	-	-	2	10%
improvement(n = 18)	8	80%	10	100%	18	90%

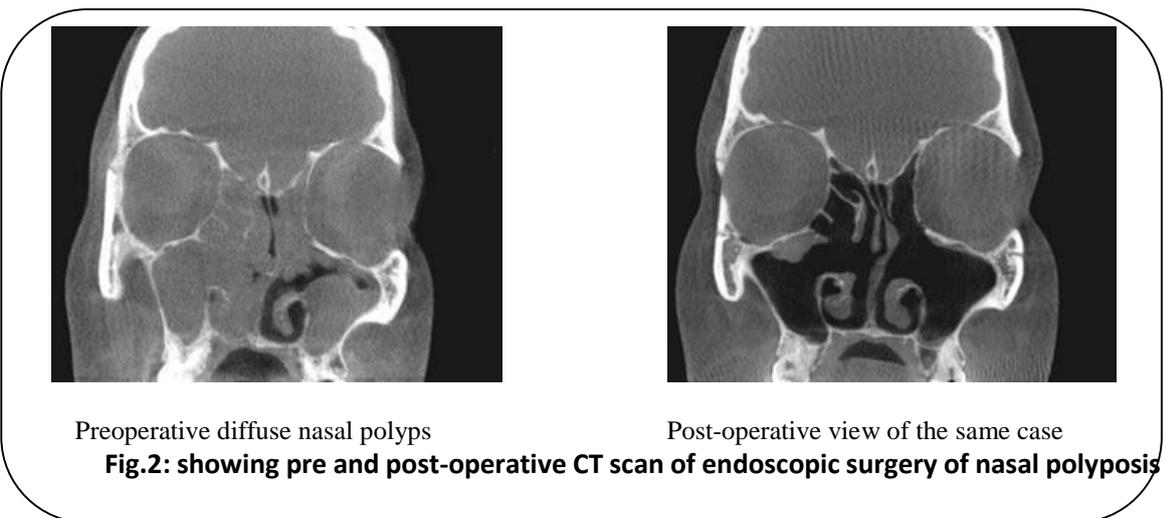
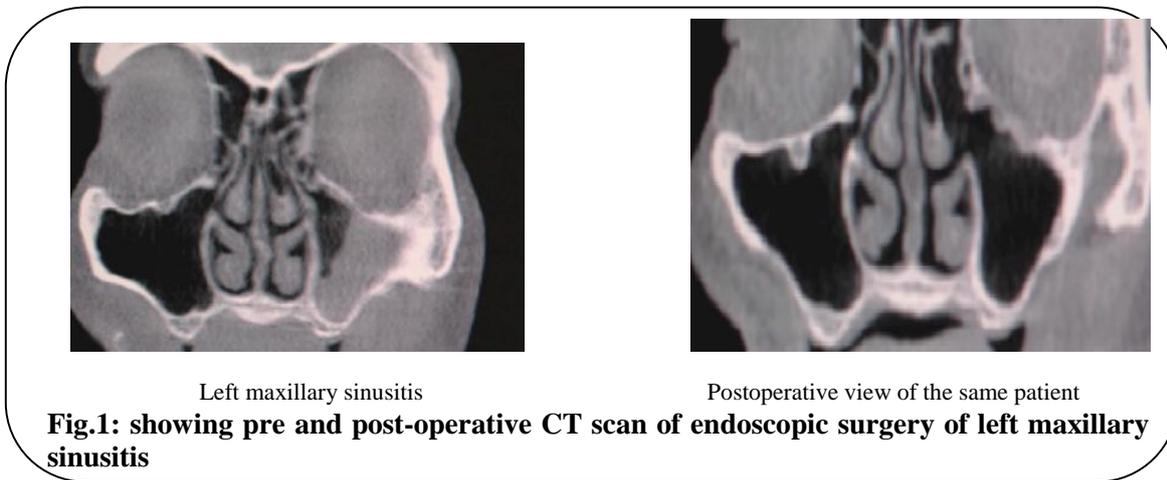
Post-operative objective assessment:

Endoscopic: the presence of polyp, discharge, edema, adhesions and scarring were considered as abnormal pathological findings. Normal cavities were detected in 65%

Table 2: post-operative endoscopic examination of chronic sinusitis group with and without polyps

Post-operative Endoscopic finding	Non polyposis (10 cases)		Middle meatal polyposis (4 cases)		Diffuse polyposis (6 cases)	
	N	%	N	%	N	%
Normal (n=13)	9	90%	2	50%	2	33.3%
Polyp and discharge (n=1)	-	-	-	-	1	16.7%
Purulent ostia (n=1)	-	-	-	-	1	16.7%
Crusts (n=5)	1	10%	2	50%	2	33.3%

Radiologic: there were extremely significant improvements when comparing preoperative and postoperative radiological scores. When comparing preoperative and postoperative CT according to the extent of disease we found that there was extremely significant correlation. In postoperative CT sinus sinus opacity was detected in two cases one of them with polyps. According to Lund Mackey's score one case has postoperative score 9 (Kartegner's syndrome which had preoperative score 20) and other case has score 20 (Samter's triad which had preoperative score 20)



Complications: only one patient had intraoperative complication which is injury to lamina papyracea. Postoperative complications were reported in 20% of cases, one case had recurrent

sinusitis and 2 cases had severe bleeding after removing nasal packs (no blood transfusion) and one case presented by recurrent polyposis.

Table 3: complications of endoscopic surgery in chronic sinusitis group

Intraoperative complications	No. of patients	Percentage (%)
1) No complications	19	95%
2) Complications:		
a) Injury to lamina papyracea	1	5%
Postoperative complications:		
1) No complications	16	80%
2) Complications:		
a) Bleeding after removing nasal packs	2	10%
b) Recurrent sinusitis	1	5 %
c) Recurrent polyposis	1	5 %

Endoscopic treatment of fungal sinusitis

Clinical Data: the results of 10 patients with fungal sinusitis were analyzed.

Age: the mean age was 38 years with a range (29-49 years).

Sex: male: female ratio was 30: 70%

Post-operative subjective assessment:

Improvement 90% and no improvement in 10% (1 patient)

No improvement in one case that was bilateral fungal sinusitis the nose was not completely open and olfactory disturbance and discharge still present and progressive course worthily

Table 4: showing post-operative subjective assessment in fungal sinusitis group

	Fungal ball (7)		Allergic fungal sinusitis (3)		Total (10)	
	N	%	N	%	N	%
No improvement(n=1)	-	-	1	10%	1	10%
improvement(n = 9)	7	77.8%	2	22.2%	9	100%

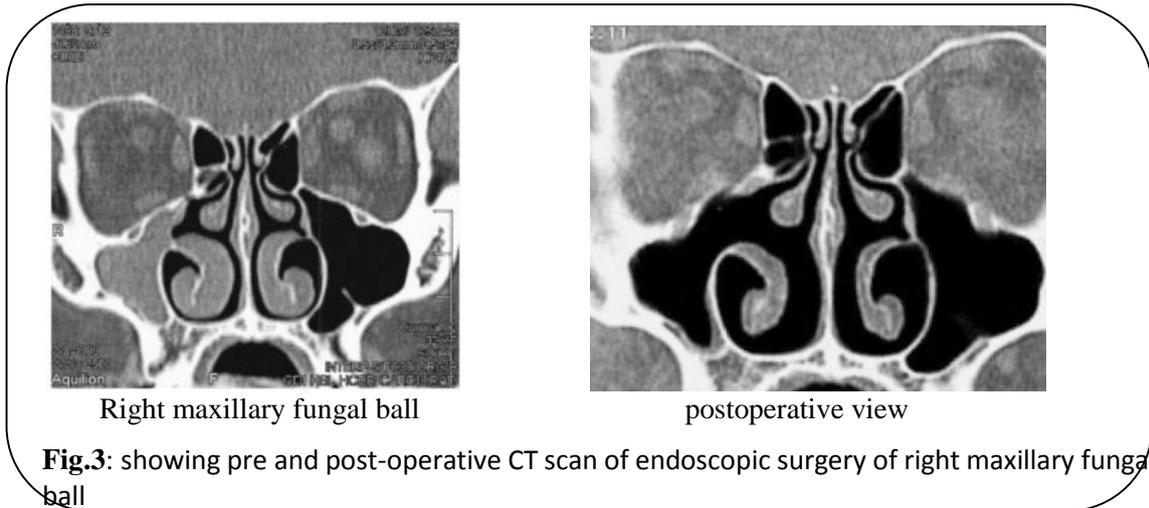
Post-operative objective assessment:

Endoscopic: the presence of polyp, discharge, edema, adhesions and scarring were considered as abnormal pathological findings. Normal cavities were detected in 80% . One case presented by edematous inflamed mucosa and multiple polyps with thick viscous secretion described as (peanut butter) which present bilaterally but polyp present in right side only.

Table 5: post-operative endoscopic examination of fungal sinusitis

Postoperative Endoscopic finding	Fungal ball (7 cases)		Allergic fungal sinusitis (3cases)	
	N	%	N	%
Normal (n=8)	7	70%	1	10%
edematous inflamed mucosa and multiple polyps with thick viscous secretion (n=1)	-	-	1	10%
Crusts (n=1)	-	-	1	10%

Radiologic: there were extremely significant improvements when comparing preoperative and Postoperative radiological scores. When comparing preoperative and postoperative CT according to the extent of disease we found that, there was extremely significant correlation. In postoperative CT, sinus opacity was detected in one case which was bilateral fungal sinusitis with preoperative score was 18.



Complications: only recurrence in one case was a complication in this group who had isolated recurrent right sided frontal fungal sinusitis displaced the orbit downward and anterior in female patient 30 years old, endoscopic sinus surgery was done by using draf II b approach.

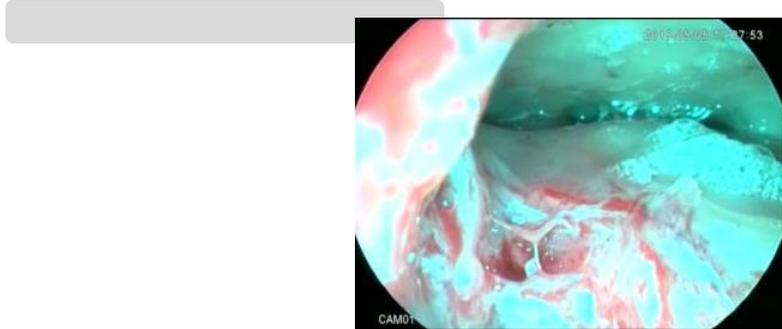


Fig.4: endoscopic view after draf II b in recurrent frontal fungal sinusitis

Septal and turbinate pathology

Clinical Data: the results of 10 patients with septal and turbinate pathology were analysed.



Fig.5: showing endoscopic septoplasty

Age: the mean age was 25 years with a range 17-32 years.

Sex: male: female ratio was 40: 60%.

Marked improvement was detected in 90% and no improvement in 10% (1 patient).

Endoscopic: the presence of polyp, discharge, edema, adhesions or crusting and scarring were considered as abnormal pathological findings. Normal cavities were detected in 80%. One case presented by left side adhesion near middle meatus.

Table 6: post-operative endoscopic examination of septal and turbinate pathology group

Postoperative Endoscopic finding	Deviated nasal septum with hypertrophied inferior turbinate (n = 4)		Deviated nasal septum with hypertrophied inferior turbinate and concha bellusa (n=2)		Hypertrophied inferior turbinates (n =3)		Hypertrophied inferior turbinates with concha bellusa (n = 1)	
	No	%	No	%	No	%	No	%
No (n=8)	2	50%	1	50%	3	100%	1	100%
Crusts (n=1)	1	25%	1	50%	-	-		
Adhesion, crusts and scars (n=1)	1	25%	-	-	-	-		

Complications: adhesion was present in one case . Bleeding after removing of nasal packs occurred in one case (no blood transfusion).

Table 7: postoperative complications

Postoperative complications:		
1)No complications	8	80%
2) Complications:		
a) Bleeding after removing nasal packs	1	10%
b) Nasal adhesions near middle meatus	1	10 %

Endoscopic repair of spontaneous CSF rhinorrhea

10 cases of spontaneous CSF fistula were done, their ages ranged from 31 - 50 years, the mean age was 39 with male and female ratio is 40:60. The main complaint is watery nasal discharge were evident in CT scan cysternography.

All the patients had successful cessation of rhinorrhea after a single procedure with postoperative leak free periods ranging from 6 months to One year. No major complications were occurred secondary to surgical management.

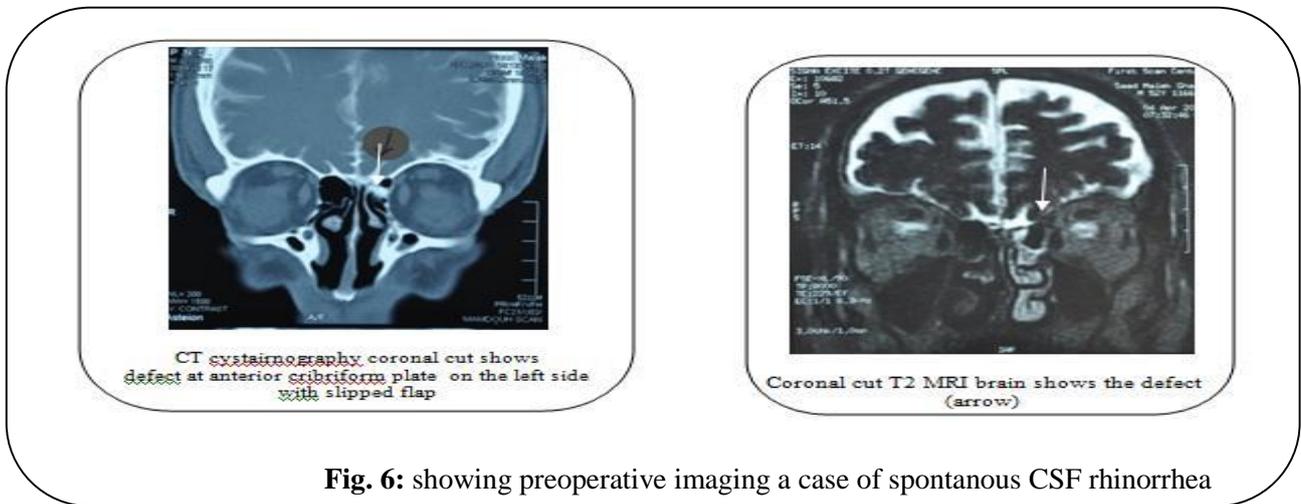


Fig. 6: showing preoperative imaging a case of spontaneous CSF rhinorrhea

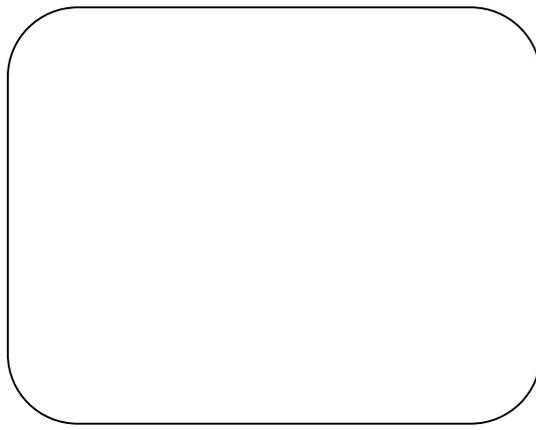
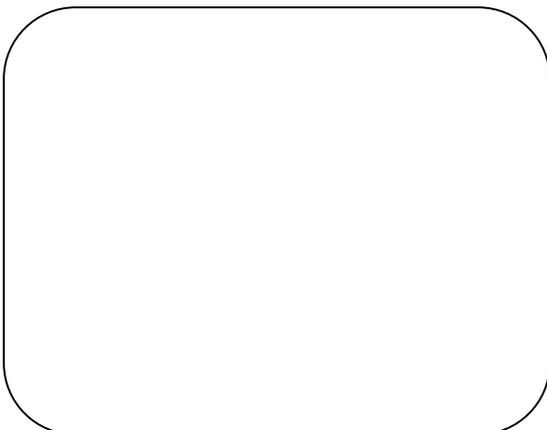




Figure 7: turbinate bone graft

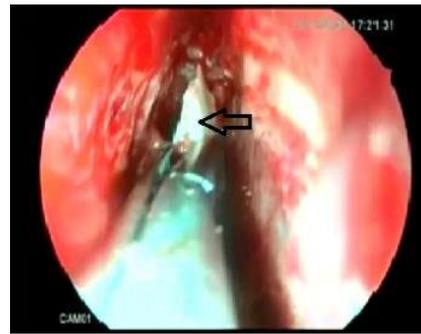


Figure 8: septal cartilage graft

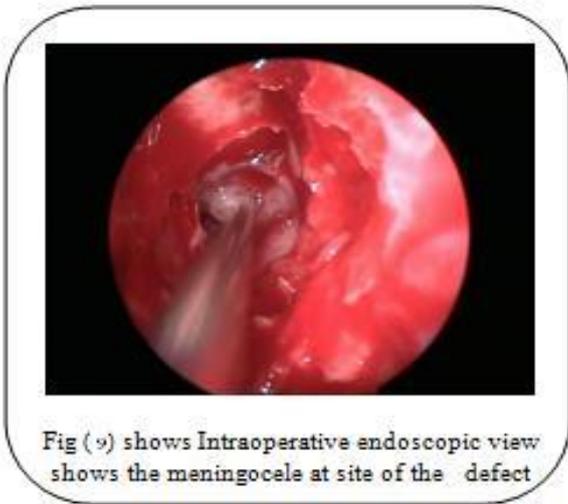


Fig (9) shows Intraoperative endoscopic view shows the meningocele at site of the defect



Fig (10) Postoperative endoscopic follow up shows healed graft.

Table 8: showing pre-operative, operative and post-operative assessment of all cases of CSF leak

Discussion:

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Patient	1	2	3	4	5	6	7	8	9	10
Sex	Male	Female	Female	Female	Male	female	Male	Female	Female	Male
Age	43	35	50	40	37	34	42	34	31	32
Atiology	Spontaneous	Spontaneous	Surgical trauma	Spontaneous	Spontaneous	Surgical trauma	Surgical trauma	Spontaneous	Spontaneous	Spontaneous
Symptoms	Watery nasal Discharge and headach	Watery nasal discharge and headach	Watery nasal discharge	Watery nasal discharge and headach	Watery nasal discharge	Watery nasal discharge and headach	Watery nasal discharge and headach	Watery nasal discharge	Watery nasal Discharge	Watery nasal discharge and headach
Duration of symptoms	1 month	4 months	3 months	2 Months	4 months	7 months	3 Months	1 Month	20 days	6 months
Side	Right	Right	Left	Right	Left	Right	Left	Left	Left	Right
Diagnosed by	CT Cystern-graphy	CT Cystern-graphy	CT Cystern-graphy	CT Cystern-graphy	CT Cystern-graphy	CT Cystern-graphy	CT Cystern-graphy	CT Cystern-graphy	CT Cystern-graphy	CT Cystern-graphy
Site of defect	Rt. Cribriform plate	Rt. Cribriform plate	Lateral wall of sphenoid	Rt. Cribriform plate	Lt. Cribriform plate	Roof of sphenoid	posterior wall of sphenoid	Lt. fovea ethmoidalis	Lt. fovea ethmoidalis	Rt. Cribriform plate
Size of the Defect	2 mm	2 mm	2,5 mm	3 mm	2 mm	3 mm	3 mm	2,5 mm	2 mm	2,5 mm
Graft used	Septal cartilage graft and mucosal flab from the septum	Septal cartilage graft and mucosal flab from the septum	bone graft of middle turbinete and fascialata graft	Septal cartilage graft and mucosal flab from the septum	Septal cartilage graft and mucosal flab from the septum	bone graft of middle turbinete and fascialata graft	bone graft of middle turbinete and fascialata graft	Septal cartilage graft and mucosal flab from theseptum	Septal cartilage graft and mucosal flab from the septum	Septal cartilage graft and mucosal flab from the septum
Leak free postoperative Period	7 Months	6 Months	8 months	6 Months	9 months	One year	6 Months	7 Months	9 Months	6 Months
Recurrence	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Chronic rhinosinusitis with and without polyps:

In our study, 90% of the patients reported improvement in symptoms from surgery at the final follow up visit. 2 (10%) patients were unchanged because of recurrence as on case was Samter's triad and another case was Kartegner's syndrome which have high recurrence rate. Our results compare very favorably to other studies of sinus surgery, **Hoffman et al.** reported about 90% improvement with mean follow up 9 months ⁽¹⁰⁾. **Kennedy** reported 97.5% symptomatic improvement ⁽¹¹⁾. **Levine** reported a success rate of 89% ⁽¹²⁾.

In agreement with results of **Ramadan** surgical causes of failure in patients with a previous endoscopic sinus surgery revealed that residual air cells and stenotic maxillary or frontal sinus Ostium were the most common causes. History of gastroesophageal reflux disease was predictor of poor symptomatic outcome with FESS. The mechanism by which GERD contributes to the pathogenesis of chronic sinusitis is not yet understood ⁽¹³⁾.

Further study of the mechanism and relationship between GERD and chronic sinusitis may help us to understand this association ⁽¹⁴⁾. In our series, two patients did not improve after surgery, because of recurrence of polyps in one case (Samter's triade) and the other case present by purulent discharge from ostia (kartenger's syndrome).

Stankiewicz suggested that the complications rate decreases with increasing experience, reporting a rate of 29% in the first 90 cases which he performed compared with only 2.2% in the subsequent 90 cases. Most of these complications were minor ⁽¹⁵⁾. **Kennedy** reported no major complications in a series of 120 patients and few minor complications ⁽¹¹⁾. **Gross et al.** reported 14 minor complications and no major complications in their series which included 106 patients ⁽¹⁶⁾. In our series, intraoperative complications were minor, only one case was injury to lamina paprycea. No severe postoperative haemorrhage which necessitated blood transfusion, no major complications was recorded postoperatively ⁽¹⁶⁾.

Endoscopic treatment of fungal sinusitis

In our study only one case was with allergic fungal sinusitis had recurrence after 6 months postoperative.

In the symptomatic assessment after the surgical procedure, we observed improvement in all items related with over 90% of the patients, confirming efficiency and benefit of the surgery, similar to the results obtained in patients of CRS⁽¹⁷⁾.

Using the same scale of values for symptoms, we observed significantly better symptomatic improvement in patients with fungal ball, who had fewer recurrences and required smaller number of reinterventions when compared to AFRS. These results evidenced the recurrent character and the severity of AFRS.

For patients with fungal ball, the level of recurrence (zero%) is near to that found by **Ferguson** who estimated in the literature review as between 4% and 10%. Manning and Kupfenberg considered that the recurrence of fungal ball is rare⁽¹⁸⁾.

The number of recurrences of AFRS was much greater, and in 33.3% of them they required surgical reintervention, marking the chronic and recurrent characteristic of the disease and its difficult control. The success of treatment with AFRS depends on three steps: to make surgical debridement to remove fungal antigens, allergic mucin and affected polypoid mucosa; to prevent recurrence of fungal growth, and to modify the immune response of host to antigen. Given that we do not always get the appropriate control of allergic symptomatology, we can expect postoperative follow-up with more recurrences.

Septal and turbinate pathology

Endoscopic septoplasty was described previously by another authors however, the techniques used have traditional septoplasty or sinus surgery instrumentation^(19,20). According to Brennan *et al.* the ideal objective in septal surgery is permanent correction of deviation with avoidance of any complication. Four basic principles are consistent with this objective: good exposure; safe elevation of flaps; resection

of only a limited, necessary amount of septum; and elimination of aetiological dynamic forces⁽²¹⁾.

However; **Hwang *et al.*** in their retrospective study of 111 patients undergoing endoscopic septoplasty, reported haematoma in 0.9 %, asymptomatic perforation in 0.9 %, and synechiae formation in 4.5 % patients⁽²¹⁾.

In a retrospective study of 116 patients, **Chung *et al.*** described transient dental pain/hyeraesthesia in 4.3 %, asymptomatic septal perforation in 3.4 %, synechiae formation in 2.6 %, epistaxis 0.9 %, septal haematoma in 0.9 %, and persistent septal deviation requiring revision septoplasty in 0.9 % patients⁽²²⁾.

However, in our study we reported only postoperative haemorrhage after removing of nasal packs (no blood transfusion) which occurred in one (10 %) patient operated for septoplasty with partial turbinectomy for which repacking was done for 24 h. No patients had septal haematoma. One patient (10%) had synechie formation, which was left alone which released by local anaesthesia.

In our study, improvement in nasal obstruction was 100% and in headache was (60%) .This result is similar to results of **Jain *et al.*** in which improvement in obstruction was 96% and in headache was 40%⁽²³⁾.

Endoscopic repair of spontaneous CSF rhinorhea

The size of the defect appears to impact the surgical outcome, with larger defects likely to result in failure of repair and recurrent leaks. Composite osteomucosal or chondromucosal flaps have also been advocated for repair of defects greater than 1-2 cm. Additionally, co-morbid conditions such as chronic cough may contribute to raised intracranial tension and failure of the repair⁽²⁴⁾.

Presutti *et al.* in their 5-year retrospective study of 52 patients with endoscopic closure of CSF leak , used a septal mucoper- chondrial graft, with no lumbar drain and fluorescein tests. They reported a success rate of 88.5% on the first attempt⁽²⁵⁾.

Banks *et al.* in their 21-year retrospective study of 193 patients with

endoscopic closure using intrathecal fluorescein localization of site of leak and lumbar drain in 73% had an initial success rate of 85–90% and an overall success rate of 98%⁽²⁶⁾.

Ye et al. in their 10-year retrospective study of 69 patients with no preoperative fluorescein injection, reported a success rate of 89% on the first attempt with an endoscopic multilayer reconstructive technique⁽²⁷⁾.

Our results of endoscopic CSF rhinorrhea repair revealed a 100% success rate on the first attempt because the number of cases was small (only 10 cases) and if the number of cases increase, complications and recurrence may be occur.

CONCLUSION

Functional endoscopic sinus surgery is the modern approach to surgery on the sinuses. In the past operations were designed to maximise drainage by gravity. As such large holes were fashioned into the sinuses and most of the lining tissue was removed. It is now known that this lining tissue plays a critical role in keeping sinuses healthy. As such the old-style surgery not infrequently worsened the problem.

Functional endoscopic sinus surgery places an emphasis on function. Given that we now know how important the normal anatomy and lining of the sinuses are to sinus health, the surgery is all about establishing ventilation and drainage along the normal pathways with maximum preservation of normal structures and in particular the sinus linings. The surgery is now a minimal rather than an extensive destructive procedure.

The availability of high definition cameras and very fine endoscopes allows for much greater control during the surgery and hence significantly better results.

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